What is claimed is:

1. A node control device which is disposed in each node device constituting an optical network system, and is used for controlling the packet transfer operation in each node device comprising:

connection information response means for inquiring of node devices adjacent to a node device which said node control device controls (hereafter the present node device) about connection information on said present node device and connection information on the node devices adjacent to said present node device each time a predetermined time elapses or a predetermined event is generated, and for responding with the connection information (sometimes including traffic information) on said present node device and connection information on the node devices adjacent to said present node device when said present node device receives said inquiry from the node devices adjacent to said present node device; and

optical path setting means for controlling optical switches based on the connection information on the entire optical network system obtained using said connection information response means when a cut-through setting packet is received or based on self judgment of said node control device, and setting optical paths which omit packet processing in the layer 2 and layer 3 systems of said present node device.

2. The node control device according to Claim 1, further comprising cut-through optical path necessary/unnecessary determination means for determining the necessity of cut through

before transmitting a cut-through request packet or transmitting a cut-through setting packet, and selectively setting the cut-through optical path only when determined as necessary.

3. The node control device according to Claim 1, further comprising information channel insuring means for determining whether the information channel is insured after setting the cut-through optical path between the node devices on the route where the cut-through optical path is set before transmitting the cut-through setting packet, and setting the cut-through optical path only when the information channel is insured.

4. A node device comprising:

a router for determining an output destination of a transfer packet which is input according to the header information;

an optical cross-connect for setting optical paths between arbitrary input/output optical fibers by extracting (dropping) optical signals from an optical fiber or inserting (adding) optical signals into an optical fiber or relaying optical signals from input fibers to output fibers; and

a node control device according to Claim 1 for switching the route of optical paths using optical switches in said optical cross-connect according to the instructions of the received transfer packet or based on self judgment.

5. The node device according to Claim 4, further comprising a switch which connects a destination-based buffer to some of the outputs from said router to said optical cross-connect, and can connect a packet read from said

destination-based buffer to an arbitrary input port of said optical cross-connect.

6. The node device according to Claim 5, further comprising allowable delay recognition function means at said router for determining the allowable delay of a transfer packet, so that packets are directly output to optical cross-connect or destination-based buffers according to their allowable delay time or packet loss ratio.

7. A node device comprising:

a router for determining an output destination of a transfer packet which is input according to the header information of the higher layer;

an optical cross-connect for setting an optical path between arbitrary input/output optical fibers by extracting (dropping) optical signals from an optical fiber, inserting (adding) optical signals into an optical fiber or relaying optical signals;

a node control device according to Claim 1 for switching the direction of said optical cross-connect according to instructions of the received transfer packet or based on self judgment; and

optical path extraction/insertion means for the information channel for extracting optical signals with a wavelength insured for the information channel from the optical fiber, or for inserting said optical signals with a wavelength into the optical fiber, so as to enable communication of information signals with another node device.

8. A node device comprising:

a router for determining an output destination of a transfer packet which is input according to the header information;

an optical cross-connect for setting an optical path between arbitrary input/output optical fibers by extracting (dropping) optical signals from an optical fiber, inserting (adding) optical signals into an optical fiber or relaying optical signals;

a node control device according to Claim 1 for switching the direction of said optical cross-connect according to the instructions of the received transfer packet or based on self judgment; and

pilot tone signal super-imposing(overlaying)/ /receiving means for the information channel for super-imposing (overlaying) pilot tone signals on an optical path for user data or separating pilot tone signals for the information channel from the optical path for user data so as to enable communication of information signals with another node device.

9. The node device according to Claim 8, wherein said pilot tone signals for the information channel are transmitted by the time division multiplex system.

10. An optical network system wherein a plurality of node devices according to Claim 4 are disposed.

11. An optical path setting method in an optical network system comprising:

(1) a step where each node device inquire of node devices adjacent to the present node device about connection information (sometimes include traffic information) on said present node device and connection information on the node devices adjacent to said present node device each time a predetermined time elapses or a predetermined event is generated, and the present node device responds with the connection information on said present node device and the connection information on the node devices adjacent to said present node device when said present node device received said inquiry; and

(2) a step where each node device controls optical switches based on the connection information on the entire optical network system which each node device obtained in said step when a cut-through setting packet is received or based on self judgment, and sets optical paths which omit the layer 2 functions and packet processing functions for layer 3 of the node device which the node control device controls.

12. The optical path setting method according to Claim 11, wherein it is determined whether the information channel is insured after setting the cut-through optical path between the node devices on the route where the cut-through optical path is set before the setting of the cut-through optical path, and the cut-through optical path is set only when the information channel is insured.

13. The optical path setting method according to Claim 11, wherein a packet read from the destination-based buffer is transmitted to the cut-through optical path after setting.

14. The optical path setting method according to Claim 13, wherein packets are stored in said destination-based buffer based on their allowable delay time or packet loss ratio.

15. The optical path setting method according to Claim 11, the information communication between the node devices, where the cut-through optical path is set, is implemented using optical signals with a wavelength insured for the information channel after said cut-through optical path is set.

16. The optical path setting method according to Claim 11, wherein the information communication between the node devices, where said cut-through optical path is set, is implemented by super-imposing (overlaying) the pilot tone signals for the information channel on the optical path for user data is set even if said cut-through optical path is set.

17. The optical path setting method according to Claim 16, wherein the pilot tone signals for said information channel are transmitted by the time division multiplex system.